UNIVERSITI SAINS MALAYSIA

First Semester Examination
Academic Session 2008/2009

November 2008

EAP 585/4 – Solid And Hazardous Waste Management

Duration: 3 hours

Please check that this examination paper consists of **FOUR (4)** pages of printed material before you begin the examination.

Instructions: This paper contains **SIX (6)** questions. Answer **FIVE (5)** questions only. All questions carry the same marks.

You may answer the question either in Bahasa Malaysia or English.

All questions **MUST BE** answered on a new sheet.

Write the answered question numbers on the cover sheet of the answer script.

1. (a) Described incompatible scheduled waste and on-site treatment facility using examples.

[10 marks]

(b) In the First Schedule of the Environmental Quality Scheduled Waste Regulations 2005, waste is classified into several categories. List all categories and give **TWO (2)** examples for each category.

[10 marks]

2. Waste generation study was done at 3 USM hostel. After a week of study, the result was shown in Table 1. The collection scheduled was on Tuesday and Saturday morning. If every block is provided $2.5m^3$ of container, container utilization factor is 0.7 and the density of waste is $150kg/m^3$.

Table 1: Waste Generation Study

Hostel Name	No. Of Block	Waste Collected (Tonne)	Average Kg/cap/day	Average Kg /block/day	Number of Student	Number of container
Active	4	5.0	0.60			
Creative	3	4.5	0.55			
Innovative	5	6.5	0.75			

(a) The average amount of waste generated per block per day

[5 marks]

(b) The total number of student for every hostel

[5 marks]

(c) Calculate number of container for each hostel.

[5 marks]

(d) If Container pickup time is 0.04h/trip, container unloading time = 0.04h/trip, hauled time constants: a = 0.02 and b = 0.02h/km, at landfill site time = 0.05h/trip, calculate the total time to collect all container at the hostel?

[5 marks]

3. An economic analysis was done to have a transfer station shown as below:

- Transfer Station Cost: cost to build, own, and operate transfer station, = RM4.50/tonne.
- Direct Haul Payload: average payload of collection vehicle hauling directly to landfill = 3.50/hr-tonne.
- Transfer Haul Payload: average payload of transfer truck hauling from transfer station to landfill, RM1.20/hr-tonne.

(a) Define what is break even point?

[5 marks]

(b) Based on the above data, plot the break even curve and determine the critical time to have a transfer station.

[15 marks]

4. What is the advantage and disadvantage of this solid treatment technique?

(i) Incineration

(ii) Composting

(iii) Landfilling

[12 marks]

(a) A city with a population of 30000 people generated solid waste at a rate of 1.5kg/capita/day . If the waste could be compacted to 6000kg/m^3.

(i) how many acres of landfill will be needed in a year? Assuming that the ratio of solid waste to soil cover is 4:1,

(ii) what volume of soil cover will be needed in a year?

[8 marks]

5. (a) Describe the criteria approach for classification of hazardous wastes.

[10 marks]

(b) List main groups of clinical waste and discuss the management aspect of them.

[10 marks]

6. (a) List and discuss the requirements for construction and manage a secured landfills

[10 marks]

(b) A treatment plant is to be installed for treating a slaughter house wastewater.

(i) State the main water quality parameter to be considered in the design of this treatment plant.

[4 marks]

(iii) Suggest one of the treatment processes suitable for treatment this wastewater.

[6 marks]

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